

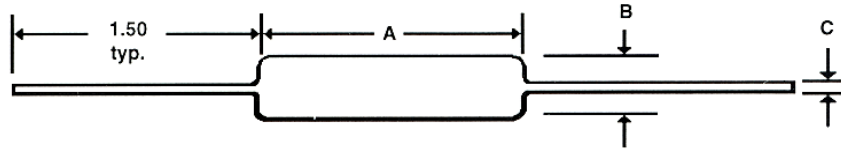
- Features:
- WWS offers miniature size at higher power rating
 - High performance for low cost
 - High power to size ratio
 - MWW – completely molded construction with welded terminations
 - Complete welded terminations
 - Tinned copper leads
 - Available in non-inductive styles
 - High temperature silicone coating
 - RoHS compliant
 - Higher operating temperatures may be available. Contact factory.



Electrical Specifications						
Type / Code	MIL-R-26 Ref.	Dielectric Strength (V)	Power Rating (Watts) @ 25°C	Resistance Temperature Coefficient	Ohmic Range(Ω) and Tolerance(1) 0.1%, 0.5%, 1% & 5%	
					Standard	Non-Inductive
(N)WWH	-	500V	0.4W	< 1Ω = ±90ppm/°C	0.1 - 2K	0.1 - 1K
(N)WW1	-	500V	1W		0.1 - 3K	0.1 - 1.5K
(N)WW1A	RW-70	500V	1W		0.1 - 7K	0.1 - 3.5K
(N)WW2	RW-69	1,000V	1.5W		0.1 - 10K	0.1 - 5K
(N)WWS2	-	500V	2.5W		0.1 - 3K	0.1 - 1.5K
(N)WW2A	-	1,000V	2.5W		0.1 - 15K	0.1 - 7.5K
(N)WW3	RW-79	1,000V	3W		0.1 - 22K	0.1 - 11K
(N)WWS3	RW-69	1,000V	3W		0.1 - 10K	0.1 - 5K
(N)WW3A	-	1,000V	3W		0.1 - 30K	0.1 - 15K
(N)WW4	-	1,000V	4W		0.1 - 40K	0.1 - 20K
(N)WWS4	RW-79	1,000V	4W	1Ω to 10Ω = ±50ppm/°C	0.1 - 22K	0.1 - 11K
(N)WW5	RW-67, RW-74	1,000V	5W		0.1 - 50K	0.1 - 25K
(N)WWS5	-	1,000V	5W		0.1 - 40K	0.1 - 20K
(N)WW7	-	1,000V	6.5W		0.1 - 70K	0.1 - 35K
(N)WWS7	RW-67, RW-74	1,000V	6.5W		0.1 - 50K	0.1 - 25K
(N)WW7B	-	1,000V	7W	>10Ω = ±20ppm/°C	0.1 - 100K	0.1 - 50K
(N)WW10	RW-78	1,000V	10W		0.1 - 150K	0.1 - 75K
(N)WWS10	-	1,000V	10W		0.1 - 100K	0.1 - 50K
(N)MWW1	RW-70	1,000V	1W		0.1 - 2K	-
(N)MWW3	RW-79	1,000V	3W		0.1 - 20K	-
(N)MWW5	RW-67, RW-74	1,000V	5W		0.1 - 40K	-
(N)MWW10	RW-68, RW-74	1,000V	10W		0.1 - 150K	-

(1) Lesser of \sqrt{PR} or maximum working voltage

Please refer to the High Power Resistor Application Note (page 4) for more information on designing and implementing high power resistor types.

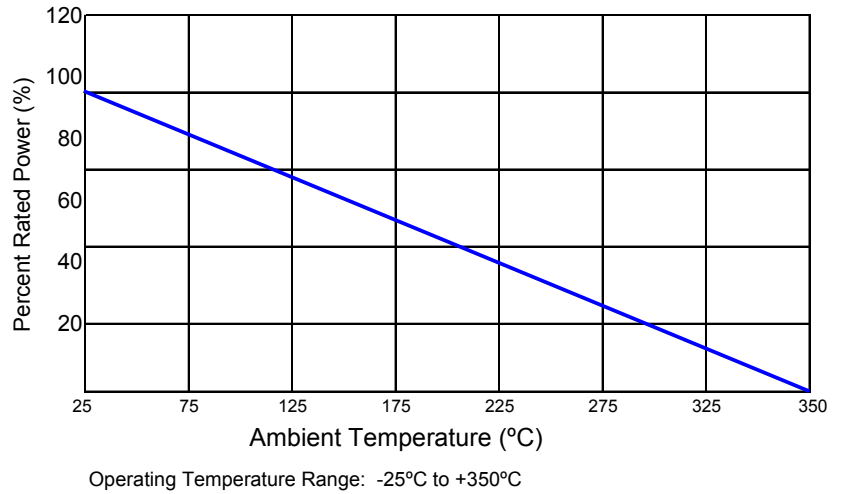


Mechanical Specifications				
Type / Code	A	B	C	Unit
(N)WWH	0.312 ± 0.062 7.9 ± 1.6	0.11 ± 0.031 2.8 ± 0.8	0.025 ± 0.002 0.64 ± 0.05	inches mm
(N)WW1 / (N)WWS2	0.375 ± 0.062 9.5 ± 1.6	0.11 ± 0.031 2.8 ± 0.8	0.025 ± 0.002 0.64 ± 0.05	inches mm
(N)WW1A	0.42 ± 0.062 10.7 ± 1.6	0.11 ± 0.031 2.8 ± 0.8	0.025 ± 0.002 0.64 ± 0.05	inches mm
(N)WW2 / (N)WWS3	0.37 ± 0.062 9.4 ± 1.6	0.156 ± 0.031 4 ± 0.8	0.032 ± 0.002 0.81 ± 0.05	inches mm
(N)WW2A	0.55 ± 0.062 14 ± 1.6	0.156 ± 0.031 4 ± 0.8	0.032 ± 0.002 0.81 ± 0.05	inches mm
(N)WW3 / (N)WWS4	0.56 ± 0.062 14.2 ± 1.6	0.187 ± 0.031 4.8 ± 0.8	0.032 ± 0.002 0.81 ± 0.05	inches mm
(N)WW3A	0.5 ± 0.062 12.7 ± 1.6	0.218 ± 0.031 5.5 ± 0.8	0.032 ± 0.002 0.81 ± 0.05	inches mm
(N)WW4 / (N)WWS5	0.7 ± 0.062 17.8 ± 1.6	0.27 ± 0.031 6.9 ± 0.8	0.036 ± 0.002 0.91 ± 0.05	inches mm
(N)WW5 / (N)WWS7	0.875 ± 0.062 22.2 ± 1.6	0.312 ± 0.031 7.9 ± 0.8	0.036 ± 0.002 0.91 ± 0.05	inches mm
(N)WW7	1 ± 0.062 25.4 ± 1.6	0.312 ± 0.031 7.9 ± 0.8	0.036 ± 0.002 0.91 ± 0.05	inches mm
(N)WW7B / (N)WWS10	1.2 ± 0.062 30.5 ± 1.6	0.312 ± 0.031 7.9 ± 0.8	0.036 ± 0.002 0.91 ± 0.05	inches mm
(N)WW10	1.78 ± 0.062 45.2 ± 1.6	0.375 ± 0.031 9.5 ± 0.8	0.036 ± 0.002(1) 0.91 ± 0.05(1)	inches mm
(N)MWW1	0.385 ± 0.062 9.8 ± 1.6	0.135 ± 0.031 3.4 ± 0.8	0.032 ± 0.002 0.81 ± 0.05	inches mm
(N)MWW3	0.56 ± 0.062 14.2 ± 1.6	0.205 ± 0.031 5.2 ± 0.8	0.032 ± 0.002 0.81 ± 0.05	inches mm
(N)MWW5	0.925 ± 0.062 23.5 ± 1.6	0.33 ± 0.031 8.4 ± 0.8	0.036 ± 0.002 0.91 ± 0.05	inches mm
(N)MWW10	1.965 ± 0.062 49.9 ± 1.6	0.48 ± 0.031 12.2 ± 0.8	0.04 ± 0.002 1.02 ± 0.05	inches mm

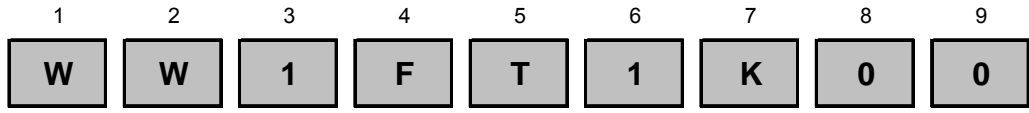
(1) Available in 0.04mm / 0.0016"

Performance Characteristics		
Test	Test Condition	Result
Moisture Resistance	1000 hours, 95% R.H., 40°C	1% max
Load Life	1000 hours, cycled power 1.5 hours ON, 0.5 hours OFF, 25°C	1%
Temperature Cycling	5 cycles, -55°C to 200°C	0.5%
Short Time Overload	5 times rated power for 5 seconds	1%

Power Derating Curve:



How to Order



Product Series		Type/Code	Power Rating @ 25°C	Tolerance		Code	Description	Size	Quantity	Resistance Value
WW	Standard	(N)WWH	0.4W	B	0.1%	T	11" reel tape	(N)WWH, (N)WW1, (N)WWS2, (N)WW1A, (N)MWW1	2,500	Four characters with the multiplier used as the decimal holder. 0.1 ohm = R100 2 Kohm = 2K00
WWS	Mini	(N)WW1	1W	D	0.5%			(N)WW2, (N)WWS3, (N)WW2A, (N)WW3, (N)WWS4, (N)MWW3	2,000	
MWW	Molded	(N)WW1A	1W	F	1%			(N)WW3A, (N)WW4, (N)WWS5, (N)WW5, (N)WWS7, (N)WW7, (N)WW7B, (N)WWS10, (N)MWW5	500	
NWW	Non-Inductive	(N)WW2	1.5W	J	5%			(N)WW10, (N)MWW10	250	
NWWs	Mini	(N)WWS2	2.5W							
	Non-Inductive	(N)WW2A	2.5W							
		(N)WW3	3W							
		(N)WWS3	3W							
		(N)WW3A	3W							
		(N)WW4	4W							
		(N)WWS4	4W							
		(N)WW5	5W							
		(N)WWS5	5W							
		(N)WW7	6.5W							
		(N)WWS7	6.5W							
		(N)WW7B	7W							
		(N)WW10	10W							
		(N)WWS10	10W							
		(N)MWW1	1W							
		(N)MWW3	3W							
		(N)MWW5	5W							
		(N)MWW10	10W							

Legacy Part Number (before January 3, 2011):

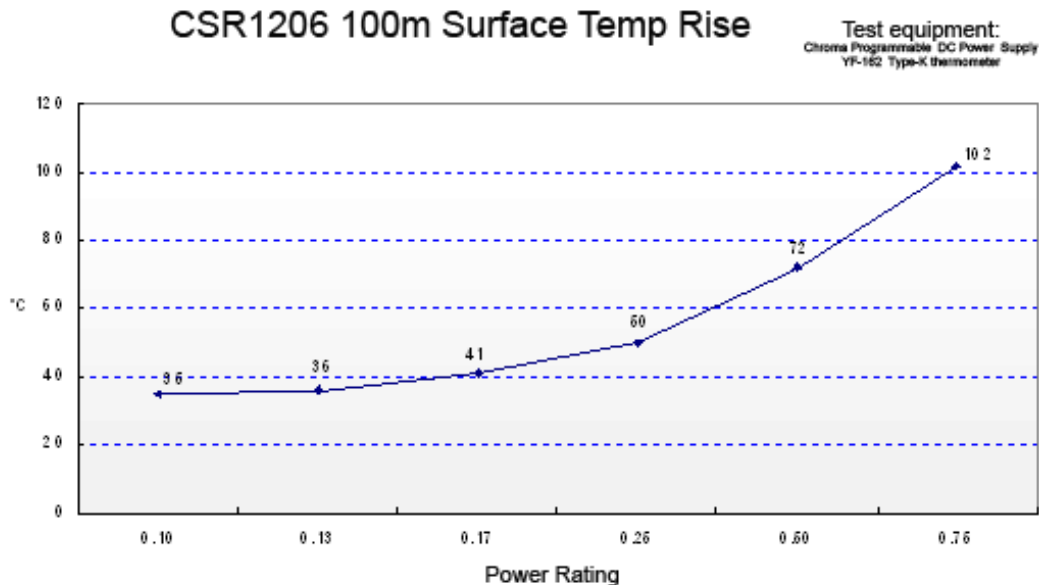
SEI Type	Code	Nominal Resistance	Tolerance	Packaging
WW	1	10K	1%	R

Type	Description	Tolerance	Types	Qty	Description	Code
WW	Standard	0.1%	(N)WWH, (N)WW1, (N)WWS2, (N)WW1A, (N)MWW1	2,500	11" reel tape	R
WWS	Mini	0.5%	(N)WW2, (N)WWS3, (N)WW2A, (N)WW3, (N)WWS4, (N)MWW3	2,000		
MWW	Molded	1%	(N)WW3A, (N)WW4, (N)WWS5, (N)WW5, (N)WWS7, (N)WW7, (N)WW7B, (N)WWS10, (N)MWW5	500		
NWW	Non-Inductive	5%	(N)WW10, (N)MWW10	250		
NWWs	Mini Non-Inductive					

High Power Chip Resistors and Thermal Management

Stackpole has developed several surface mount resistor series in addition to our current sense resistors, which have had higher power ratings than standard resistor chips. This has caused some uncertainty and even confusion by users as to how to reliably use these resistors at the higher power ratings in their designs.

The data sheets for the RHC, RMCP, RNCP, CSR, CSRN, CSRF, CSS, and CSSH state that the rated power assumes an ambient temperature of no more than 100 degrees C for the CSS / CSSH series and 70 degrees C for all other high power resistor series. In addition, IPC and UL best practices dictate that the combined temperature on any resistor due to power dissipated and ambient air shall be no more than 105C. At first glance this wouldn't seem too difficult, however the graph below shows typical heat rise for the CSR ½ 100 milliohm at full rated power. The heat rise for the RMCP and RNCP would be similar. The RHC with its unique materials, design, and processes would have less heat rise and therefore would be easier to implement for any given customer.



The 102 degrees C heat rise shown here would indicate there will be additional thermal reduction techniques needed to keep this part under 105C total hot spot temperature if this part is to be used at 0.75 watts of power. However, this same part at the usual power rating for this size would have a heat rise of around 72 degrees C. This additional heat rise may be dealt with using wider conductor traces, larger solder pads and land patterns under the solder mask, heavier copper in the conductors, vias through PCB, air movement, and heat sinks, among many other techniques. Because of the variety of methods customers can use to lower the effective heat rise of the circuit, resistor manufacturers simply specify power ratings with the limitations on ambient air temperature and total hot spot temperatures and leave the details of how to best accomplish this to the design engineers. Design guidelines for products in various market segments can vary widely so it would be unnecessarily constraining for a resistor manufacturer to recommend the use of any of these methods over another.

Note: The final resistance value can be affected by the board layout and assembly process, especially the size of the mounting pads and the amount of solder used. This is especially notable for resistance values ≤ 50 m Ω . This should be taken into account when designing.